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FEBRUARY 16, 1987

CHEMICAL & ENGINEERING

NEWS

The Russian composer-chemist died 100 years ago **Page 28**

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CHEMICAL & ENGINEERING
NEWS

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News of the Week

■ **Superconducting Super Collider is causing controversy in scientific community over cost and creating interest among states vying for site selection.** **Page 4**

■ **Worldwatch Institute's annual report deplores priorities of science in environmentally threatened world.** **Page 5**

■ **U.S. man-made fiber production increased in 1986; however, capacity was down.** **Page 5**

■ **EPA will share some authority with Office of Management & Budget in administering newly reauthorized Superfund.** **Page 6**

■ **NSF, in a push to improve science education for children, awards three grants totaling $6.6 million.** **Page 6**

Cover: Portrait of Aleksandr Borodin, painted in 1870 by Elena Timofeevna Makovskaia, is in the State Central Museum of Musical Culture in Moscow

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Business

Chemical companies spent a record $970 million in 1986 on pollution control, according to a Department of Commerce survey. **Page 9**

International Business

U.K. board of inquiry selects pressurized-water reactor for the next commercial nuclear power station. **Page 10**

Government

Reagan outlines his vision of science and technology in national policy in a comprehensive statement sent to Congress. **Page 17**

Funding increase of 11% is proposed for NSF chemical research in fiscal 1988 budget. **Page 21**

Override of President's veto of clean water bill has environmentalists cautiously optimistic about future of other environmental bills. **Page 22**

Technology

PPG biotechnology R&D agreement with Scripps is beginning to pay off in terms of basic research with potential commercial uses. **Page 24**

Improved glass interlayer process enables Monsanto to cut production costs and improve product quality. **Page 25**

Sedimentation field-flow fractionator that separates and characterizes particles and macromolecules is introduced by Du Pont. **Page 26**

Filtration/separation products are now a $3.5 billion business in the U.S., spurred by electronics and biotechnology. **Page 26**

Special Report

February marks the 100th anniversary of the death of Russian composer and chemist Aleksandr Porfir'evich Borodin, whose works, both musical and chemical, are better known than his name. **Page 28**

NSF's chemical funding to rise 11% in 1988

Further details of President Reagan's fiscal 1988 budget proposal (C&EN, Jan. 19, page 21), including funding being sought for chemical programs at the Department of Energy and the National Science Foundation, became available late last month as the Office of Management & Budget and the various federal agencies released their budget support documents.

These documents show that at NSF, whose total proposed budget for fiscal 1988 is up almost 17% to $1.9 billion, funding for the chemistry division is up 10% to $103 million. That is only $2 million more than was requested for the division in fiscal 1987. For fiscal 1987, Congress cut NSF's research and related activities budget request 5% or $73 million. It told NSF to make the cuts wherever it pleased.

The chemistry division absorbed $7.5 million of the budget shortfall. That was achieved, according to budget documents, "by reducing support of core scientific research projects in all programs and deferring the plan to increase support for maintenance and operations associated with new shared instruments. Research activities underpinning biotechnology, collaborative research in areas such as materials chemistry, and research in computational chemistry will be supported at half the requested levels" in fiscal 1987.

The result of all this is a fiscal 1988 budget request for the chemistry division that is almost a duplicate of the fiscal 1987 request. The exceptions are chemical instrumentation, for which $13 million was requested in fiscal 1987 and $10 million is being requested in fiscal 1988, and special projects, for which the requests are $7 million for 1987 and $11 million for 1988. The special projects office was set up last year to support collaborative research projects, as well as high-risk, innovative projects that don't really fit into the mainstream of current chemical research.

Of the $9.2 million increase requested for the chemistry division, $3.1 million would be devoted to strengthening the competitive base of U.S. colleges and universities in chemistry by increasing the support of student coworkers on research projects and continued support of Presidential Young Investigators. Another $2.3 million would go to support "the chemistry of interfaces," $2 million to continue the initiative in the chemistry of life processes, and $1.9 million to increase the involvement of undergraduate students and faculty members from primarily undergraduate institutions in emerging areas of contemporary chemical research.

Funding for other NSF programs that provide support, in whole or in part, for chemical research would be up 11%, or $15 million, to $143 million in fiscal 1988 if Congress were to accept the budget request in toto.

DOE is asking for an 8% increase to $124 million for the operating expenses of its chemical sciences research program in fiscal 1988. Of that amount $88 million would be spent on research and the other $36 million on facilities operation. According to DOE, this budget would provide support for 877 researchers, up from 847 in the current fiscal year, with university investigators accounting for slightly more than 30% of the total. In addition, another $75 million would be allocated for support of the national laboratories, up from $69 million in 1987.

DOE's fiscal 1988 budget request for materials science is $170 million. That amount represents a 10% increase over current funding and would provide support for 1010 researchers, 12 more than in fiscal 1987, with university investigators accounting for 21% of the total. The materials science contribution toward support of the national laboratories would be $110 million, an 8% rise over the current level.

Janice Long, Washington

NSF chemical program funding totals $246 million

$ Millions	1988[a]	1987[a]	1986[b]	% change 1987–88
Chemistry	**$102.7**	**$ 93.5**	**$ 85.6**	**10%**
Physical chemistry	29.9	28.3	27.3	6
Organic & macromolecular chemistry	24.1	22.7	21.2	6
Inorganic, bioinorganic & organometallic chemistry	15.4	14.4	14.2	7
Analytical & surface chemistry	12.3	11.7	11.5	5
Special projects	11.0	6.4	3.6	72
Chemical instrumentation	10.0	10.0	8.0	0
Materials research	**62.0**	**56.6**	**54.2**	**10**
Laboratories	27.6	26.5	25.7	5
National facilities	11.3	10.5	9.9	8
Solid-state chemistry	9.6	8.6	8.3	12
Materials research groups	8.0	6.0	4.5	33
Instrumentation	5.3	5.0	5.8	6
Chemical, biochemical & thermal engineering	**28.4**	**25.6**	**25.0**	**11**
Thermal systems & engineering	8.9	8.0	8.0	11
Thermodynamics & transport phenomena	5.0	4.6	4.4	9
Process & reaction engineering	4.0	3.6	3.6	11
Multiphase & interfacial phenomena	3.6	3.3	3.1	9
Kinetics & catalysis engineering	3.5	3.1	3.0	13
Separation & purification processes	3.4	3.0	2.9	13
Biochemistry	**16.6**	**14.9**	**14.2**	**11**
Chemical oceanography	**15.0**	**13.4**	**12.0**	**12**
Atmospheric chemistry	**10.5**	**8.6**	**6.9**	**22**
Experimental & theoretical geochemistry	**6.6**	**5.9**	**5.7**	**12**
Volcanology & mantle geochemistry	**4.2**	**3.7**	**3.5**	**14**
TOTAL	**$246.0**	**$222.2**	**$207.3**	**11%**

a Estimate. b Actual. Source: National Science Foundation

NOTE

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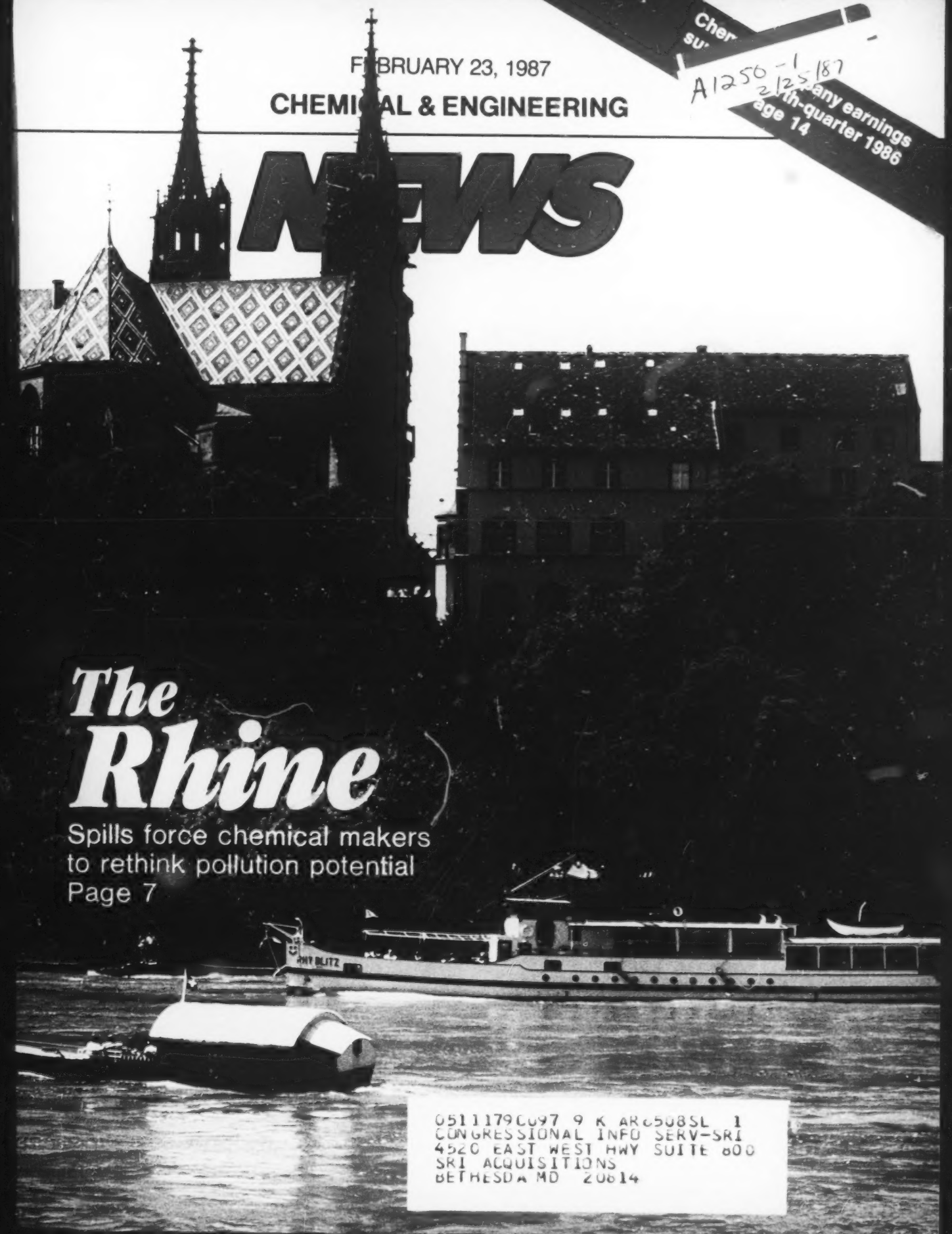

The Rhine

Spills force chemical makers to rethink pollution potential
Page 7

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CHEMICAL & ENGINEERING NEWS

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News of the Week

■ **Bipartisan group of Congressmen pushes for an international effort to curb man-made emissions suspected of thinning Earth's protective ozone layer.** **Page 4**

■ **Forum on nuclear arms issues, sponsored by Soviet Academy of Sciences, is held in Moscow and attended by an international group of scientists, politicians, businessmen, and environmentalists.** **Page 5**

■ **Alvin Trivelpiece, now assistant secretary for energy research at DOE, is named to succeed William Carey as AAAS chief.** **Page 6**

■ **Henry Hass, noted researcher in the chlorination and nitration of paraffins, is dead at 85.** **Page 6**

Cover: Rhine River at Basel. Photo by C&EN's James H. Krieger

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Business

U.S. chemical firms' earnings increased sharply in fourth-quarter 1986 on only a modest rise in sales. **Page 14**

Du Pont suit against Allied-Signal charging infringement of Du Pont's polyester engineering resin patent seeks key Allied data. **Page 18**

International Business

Canadian chemical producers' profits jumped in 1986, despite relatively weak fourth quarter. **Page 19**

Global man-made fiber output shifts away from U.S., Japan, and West European countries. **Page 20**

Government

Nuclear reactor at Hanford, Wash., which shares some features with Chernobyl model, will keep operating with safety alterations. **Page 23**

Chemical Warfare Review Commission is accused by GAO of violating established administrative procedures. **Page 24**

EPA receives first premanufacture notification from a company seeking to field test genetically engineered microorganisms. **Page 24**

Education

Science and technology in society programs and an interdisciplinary approach are focus of effort to develop technological literacy. **Page 26**

Science

Global decrease in forests and biological species is a critical issue, warns AAAS keynote speaker Peter Raven. **Page 28**

ACS News

Region V director candidates I. Dwaine Eubanks, Louis J. Sacco Jr., and John G. Verkade discuss their views on ACS. **Page 30**

News Focus

In the aftermath of the fire-related spill of toxic chemicals and other releases into the Rhine, chemical firms and governments alike review environmental regulations. **Page 7**

Chemical Earnings Rise Sharply In Fourth Quarter

William J. Storck, C&EN New York

Earnings for major U.S. chemical firms increased sharply in the fourth quarter of 1986, spurred by lower raw material costs, continued efficiency improvements, and better foreign trade conditions. Major diversified companies that produce chemicals also posted improved earnings, but oil and gas producers with chemical operations registered lower earnings, because of poor oil pricing during the period.

Although the chemical business in terms of demand and pricing is still far from robust, most chemical producers have introduced process efficiencies, cut staff and other costs, and taken advantage of lower raw material costs to such an extent that breakeven points have been lowered to levels where there is tremendous earnings leverage. Thus, even a small rise in capacity utilization can now result in a large rise in profits.

Also, chemical companies are finding that demand is coming back, even in the basic building-block chemicals such as ethylene and propylene, spurred by increased domestic demand and improving trade conditions. However, companies may have milked domestic demand about as much as they can for the immediate future. Industry analysts and economists say that demand for chemicals from the automotive area (one of three large chemical markets—the others are housing and agriculture) may not improve much in 1987. They feel that the tax reform that took effect Jan. 1, which prevents deductions of interest charges on consumer debt and also

Chemical industry leaders for the fourth quarter . . .

Sales

Rank 1986		$ Millions	Rank 1985
1	Dow Chemical	$2862.0	1
2	Union Carbide	1600.0	3
3	Monsanto	1570.0	2
4	PPG Industries	1200.0	4
5	American Cyanamid	949.6	5
6	Celanese	700.0	6
7	Hercules	640.5	7
8	National Distillers	541.3	10
9	Air Products	533.7	9
10	Rohm & Haas	468.6	8

Earnings

	$ Millions	Rank 1985
Dow Chemical	$169.0	nr
PPG Industries	73.0	1
Celanese	57.0	2
American Cyanamid	52.1	13
Hercules	47.4	5
Ethyl	45.8	3
Air Products	38.9	4
Rohm & Haas	35.8	7
National Distillers	29.5	10
Monsanto	23.0	29

Profitability

	Earnings as % of sales	Rank 1985
Ethyl	11.7%	3
International Flavors	11.6	1
Freeport-McMoRan	11.2	2
Celanese	8.1	8
Nalco Chemical	7.9	4
Loctite	7.8	5
Rohm & Haas	7.6	15
Hercules	7.4	10
Air Products	7.3	6
Aristech	6.3	19
Cabot	6.3	7

. . . and for full-year 1986

Sales

Rank 1986		$ Millions	Rank 1985
1	Dow Chemical	$11,405.0	1
2	Monsanto	6,879.0	2
3	Union Carbide	6,300.0	3
4	PPG Industries	4,700.0	4
5	American Cyanamid	3,815.9	5
6	Celanese	2,891.0	6
7	Hercules	2,615.0	7
8	Rohm & Haas	2,066.9	8
9	Air Products	2,040.0	9
10	National Distillers	1,729.6	11

Earnings

	$ Millions	Rank 1985
Dow Chemical	$741.0	nr
Monsanto	365.0	2
PPG Industries	316.0	1
Celanese	213.0	3
Hercules	206.4	5
American Cyanamid	202.5	8
Ethyl	177.7	6
Rohm & Haas	169.3	7
Air Products	144.0	4
Union Carbide	130.0	9

Profitability

	Earnings as % of sales	Rank 1985
International Flavors	13.8%	1
Ethyl	11.3	4
Freeport-McMoRan	10.4	2
Loctite	8.7	5
Rohm & Haas	8.2	9
Hercules	7.9	11
Nalco Chemical	7.9	3
Celanese	7.4	10
Air Products	7.1	6
PPG Industries	6.7	8

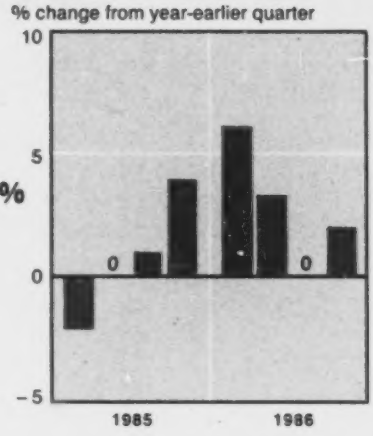
Note: Based on 30 companies listed on page 16. nr = not ranked.

Chemical industry 1986 fourth-quarter results

- Sales increased slightly
- Earnings soared
- Profit margins rose to 4.9%
- Production was up 5%
- Prices continued to fall

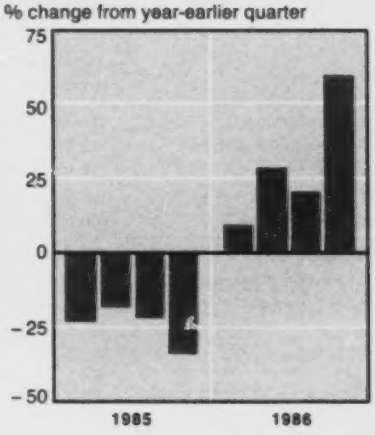
Sales

% change from year-earlier quarter



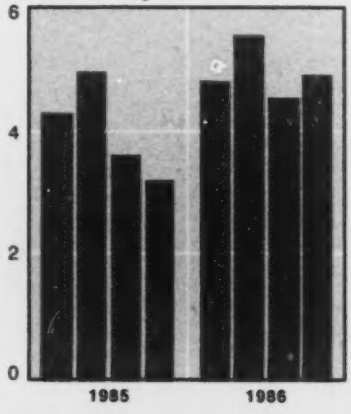
Earnings

% change from year-earlier quarter



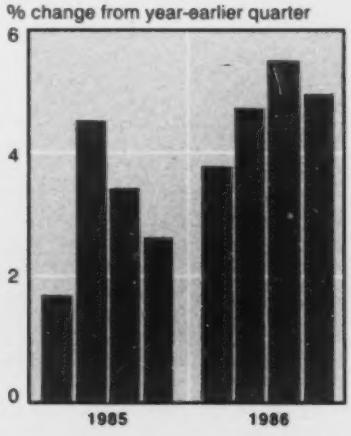
Profit margins

After-tax earnings as % of sales



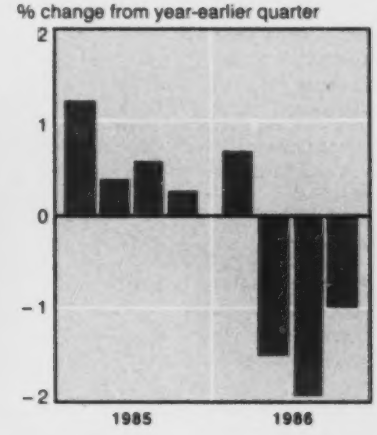
Production

% change from year-earlier quarter



Prices

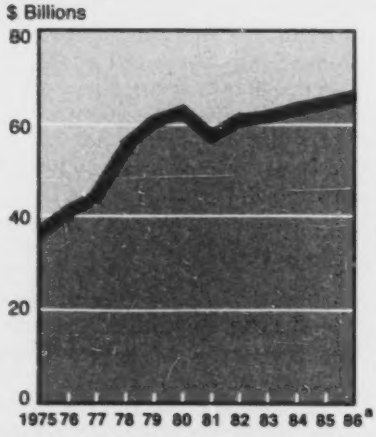
% change from year-earlier quarter



Sales in 1986 were up slightly while earnings climbed almost 25%, driving profit margins back up to 5%

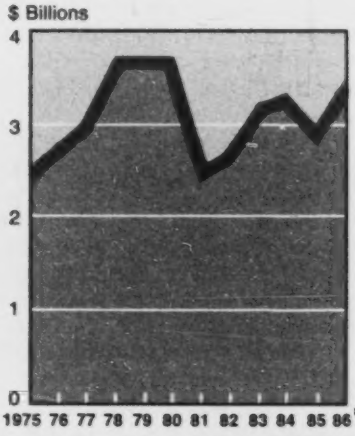
Annual sales

$ Billions



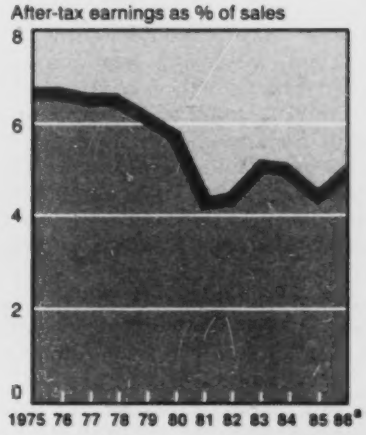
Annual earnings

$ Billions



Annual profit margins

After-tax earnings as % of sales



Note: All sales, earnings, and profit-margin data are based on combined results of 30 companies listed on page 16. a C&EN estimates.

Earnings, profit margins increase at most chemical companies

	FOURTH-QUARTER 1986						FULL-YEAR 1986					
	Sales	Earnings[a]	Change from 1985		Profit Margin[b]		Sales	Earnings[a]	Change from 1985		Profit Margin[b]	
	($ millions)		Sales	Earnings	1986	1985	($ millions)		Sales	Earnings[a]	1986	1985
Air Products[c]	$ 533.7	$ 38.9	15%	7%	7.3%	7.8%	$ 2,040.0	$ 144.0	10%	−3%	7.1%	7.9%
American Cyanamid[c]	949.6	52.1	7	396	5.5	1.2	3,815.9	202.5	8	68	5.3	3.4
Aristech	176.0	11.1	−7	98	6.3	3.0	750.8	47.6	−5	132	6.3	2.6
Cabot	300.8	18.8	−16	−31	6.3	7.6	1,253.3	56.5	−10	−19	4.5	5.0
Celanese[c]	700.0	57.0	−8	14	8.1	6.6	2,891.0	213.0	−5	20	7.4	5.8
Chemed	92.8	3.8	14	6	4.1	4.4	359.5	16.6	10	1	4.6	5.0
Crompton & Knowles	53.8	2.2	13	−1	4.0	4.6	213.2	8.9	9	14	4.2	4.0
Dow Chemical[c,d]	2,862.0	169.0	−2	def	5.9	def	11,405.0	741.0	−1	1178	6.5	0.5
Ethyl[c]	391.0	45.8	3	21	11.7	10.0	1,579.3	177.7	2	36	11.3	8.9
First Mississippi	62.3	0.1	−16	−97	0.1	4.2	247.3	4.8	−12	−62	1.9	4.4
Freeport-McMoRan	157.1	17.6	1	8	11.2	10.5	615.2	63.8	−15	−21	10.4	11.1
H. B. Fuller	139.9	5.2	20	22	3.7	3.6	528.6	18.9	15	42	3.6	2.9
B. F. Goodrich[c]	na	na	na	na	na	def	na	na	na	na	na	def
W. R. Grace[c]	na	na	na	na	na	2.2	na	na	na	na	na	2.0
Hercules[c]	640.5	47.4	1	53	7.4	4.9	2,615.0	206.4	1	45	7.9	5.5
International Flavors	145.7	17.0	19	16	11.6	12.0	620.7	85.7	24	23	13.8	13.9
International Minerals[c]	380.7	−8.9	76	def	def	0.6	1,571.6	5.8	34	−86	0.4	3.7
Loctite	81.0	6.4	24	14	7.8	8.5	292.4	25.3	22	32	8.7	8.0
Lubrizol	na	na	na	na	na	5.6	na	na	na	na	na	6.7
Monsanto[c]	1,570.0	23.0	−11	def	1.5	def	6,879.0	365.0	2	71	5.3	3.2
Nalco Chemical	189.0	14.9	2	−14	7.9	9.4	736.1	58.0	8	−13	7.9	9.8
National Distillers[c]	541.3	29.5	17	93	5.4	3.3	1,729.6	55.1	7	−11	3.2	3.8
Olin[c]	408.0	8.2	4	−2	2.0	2.1	1,710.0	75.2	−2	89	4.4	2.3
Pennwalt	279.0	12.6	7	101	4.5	2.4	1,107.6	51.9	8	363	4.7	1.1
Petrolite	65.9	3.5	−18	−2	5.4	4.5	280.0	17.5	−9	−22	6.2	7.3
PPG Industries[c]	1,200.0	73.0	9	24	6.1	5.4	4,700.0	316.0	9	4	6.7	7.0
Reichhold Chemicals	164.7	0.9	−15	def	0.5	def	765.6	15.9	−7	def	2.1	def
Rohm & Haas[c]	468.6	35.8	0	80	7.6	4.2	2,066.9	169.3	1	24	8.2	6.6
Union Carbide[c]	1,600.0	14.0	0	180	0.9	0.3	6,300.0	130.0	−2	9	2.1	1.9
Witco	326.1	16.5	−6	9	5.1	4.3	1,355.0	65.2	−6	15	4.8	3.9
Total 12 largest firms[e]	**$ 9,383.4**	**$415.8**	**3%**	**69%**	**4.4%**	**2.7%**	**$37,898.3**	**$2060.1**	**4%**	**26%**	**5.4%**	**4.5%**
Smaller 14 firms	**$ 2,234.0**	**$130.4**	**−2%**	**15%**	**5.8%**	**5.0%**	**$ 9,125.2**	**$ 536.6**	**−1%**	**15%**	**5.9%**	**5.1%**
GRAND TOTAL[e]	**$11,617.4**	**$546.2**	**2%**	**52%**	**4.7%**	**3.2%**	**$47,023.4**	**$2596.7**	**3%**	**23%**	**5.5%**	**4.6%**

a After-tax earnings from continuing operations excluding significant nonrecurring and extraordinary items. b After-tax earnings as a percentage of sales. c One of largest 15 companies. d Includes significant nonrecurring item in fourth-quarter and full-year 1985. e Totals for larger companies and for total 26 companies exclude Dow, which, because of included nonrecurring items, would make years not comparable. **na** = not available. **def** = deficit.

the deduction of sales tax on big-ticket items such as automobiles, will slow auto buying at least through the first half of this year. Also, sales incentives offered by U.S. auto makers in the latter part of 1986 encouraged some auto buyers, who normally would have waited until 1987, to make their purchases in 1986 to take advantage of cut-rate financing and other deals.

The housing market also is forecast to be soft in 1987, as some parts of the country are overbuilt in terms of apartments and single family houses. And the tax reform measure has removed incentives from speculative building.

Agriculture too is a problem, domestically as well as worldwide. Supply of agricultural products has far outstripped demand in recent years hurting all agricultural chemicals.

This leaves foreign trade to take up some of the slack in demand this year, and if the latter part of 1986 is any indication, it is trying. Finally, helped by the weaker dollar, chemical trade in 1986 rebounded from a five-year slide, with the chemical trade surplus increasing 7.5% over the previous year (C&EN, Feb. 9, page 6). The weaker dollar, besides making domestically produced chemicals cheaper abroad and foreign chemicals more expensive here, will raise the price of imported finished goods, thus making it more difficult for them to compete with domestically produced goods. This, in turn, may increase chemical markets within the U.S. somewhat.

The improvement in foreign business is apparent in comments made by company executives. For instance, Du Pont chairman and chief executive officer Richard E. Heckert says, "Most of our chemical and specialty products businesses posted strong earnings, reflecting an improved cost structure and strength overseas."

The improvement in efficiency and foreign trade was what led to a tremendous increase in earnings in the fourth quarter. It certainly wasn't

Profits dropped for major oil companies but rose for most diversified firms

	% chemical sales	FOURTH-QUARTER 1986 Sales ($ millions)	Earnings[a] ($ millions)	Change from 1985 Sales	Change from 1985 Earnings	Profit margin[b] 1986	Profit margin[b] 1985	FULL-YEAR 1986 Sales ($ millions)	Earnings[a] ($ millions)	Change from 1985 Sales	Change from 1985 Earnings	Profit margin[b] 1986	Profit margin[b] 1985
OIL AND GAS COMPANIES													
American Petrofina	15%	$ 527.9	$ 5.0	−20%	def	1.0%	def	$ 2,020.9	$ −24.6	−17%	def	def	def
Amoco	14	4,800.0	165.0	−35	−58%	3.4	5.3%	20,200.0	973.0	−30	−50%	4.8%	6.8%
Ashland	18	1,600.0	27.0	−20	−46	1.7	2.5	6,900.0	191.0	−15	12	2.8	2.1
Atlantic Richfield	17	3,724.0	64.0	−32	−55	1.7	2.6	15,092.0	615.0	−33	85	4.1	1.5
Chevron	6	5,900.0	230.0	−45	−62	3.9	5.6	27,600.0	1,030.0	−39	−33	3.7	3.4
Kerr-McGee	14	588.8	8.8	−35	−68	1.5	3.1	2,534.6	23.3	−24	−83	0.9	4.1
Mobil	5	12,000.0	201.0	−27	−53	1.7	1.4	49,400.0	1,555.0	−18	0	3.1	2.6
Phillips Petroleum	15	2,380.0	11.0	−39	−91	0.5	3.1	10,020.0	110.0	−37	−76	1.1	2.8
Shell Oil	17	4,512.0	192.0	−18	−65	4.3	9.9	17,353.0	821.0	−15	−47	4.7	7.5
Standard Oil	4	2,264.0	67.0	−39	−82	3.0	10.3	10,022.0	499.0	−27	−66	5.0	10.6
Sun	24	2,210.0	54.0	−50	−60	2.4	3.1	10,440.0	383.0	−31	−27	3.7	3.5
Texaco	3	7,800.0	−59.0	−38	def	def	2.6	32,600.0	616.0	−31	−51	1.9	2.6
Unocal (Union Oil)	11	2,060.0	49.2	−29	def	2.4	def	8,350.0	90.8	−28	−70	1.1	2.6
DIVERSIFIED MANUFACTURERS													
Allied-Signal	24	3,035.0	69.0	16	11	2.3	2.4	11,794.0	559.0	29	32	4.7	4.7
Borden	33	1,356.4	68.8	9	23	5.1	4.5	5,002.1	223.3	6	15	4.5	4.1
Borg-Warner	28	913.0	52.5	6	−16	5.8	7.3	3,623.4	206.1	9	15	5.7	5.4
Du Pont	44	6,677.0	335.0	−12	−11	5.0	4.9	27,148.0	1,538.0	−8	38	5.7	3.8
Eli Lilly	22	969.4	124.3	19	0	12.8	15.2	3,720.4	558.2	14	8	15.0	15.8
Engelhard	26	702.2	14.3	4	28	2.0	1.6	2,289.5	53.3	1	25	2.3	1.9
FMC	43	778.1	50.8	−9	30	6.5	4.6	3,002.0	152.5	−8	−22	5.1	6.0
GAF	50	182.2	19.0	5	56	10.5	7.0	753.8	80.7	3	49	10.7	7.4
General Electric	8	12,270.0	730.0	41	14	5.9	7.3	35,210.0	2,492.0	24	9	7.1	8.0
Kaiser Aluminum	13	544.6	−38.9	6	def	def	def	2,221.5	−54.4	10	def	def	def
Koppers	44	329.7	15.4	−6	def	4.7	def	1,396.4	63.2	0	def	4.5	def
Merck	13	1,149.1	171.8	20	28	15.0	14.0	4,128.9	675.7	16	25	16.4	15.2
3M	15	2,112.0	185.0	8	25	8.8	7.5	8,602.0	779.0	10	17	9.1	8.5
Pfizer	10	1,162.9	158.4	10	14	13.6	13.2	4,476.0	660.0	11	14	14.7	14.4
Tyler	41	237.0	0.1	8	−81	0.1	0.3	961.4	11.9	5	−22	1.2	1.7
Vulcan Materials	27	237.0	15.6	−1	9	6.6	6.0	957.8	93.2	−1	17	9.7	8.2

a Earnings from continuing operations excluding significant extraordinary items. b After-tax earnings as a percentage of sales. def = deficit.

production and prices. Chemical production in the fourth quarter was up only about 5% over the same period in 1985 and prices in the period for chemicals and allied products were actually down slightly from the same three-month period the year before.

Thus, sales dollar volume in the fourth quarter was nothing to write home about. For 26 of the 30 major chemical firms that C&EN normally surveys, combined sales in the fourth quarter increased only 2% to $11.6 billion. W. R. Grace, B. F. Goodrich, and Lubrizol did not report in time to be included in the total. Dow Chemical is not included because its fourth-quarter 1985 earnings included a massive nonrecurring charge that cannot be factored out. Thus, if Dow were included, the comparisons would be meaningless.

However, in spite of the only 2% rise in chemical sales for the firms, the 26 companies reported combined earnings of $546 million, up a significant 52% from the same period the year before. As a result, profitability for the companies improved considerably. Profit margins (after-tax earnings as a percentage of sales) for the group averaged 4.7% in the fourth quarter of 1986, compared with just 3.2% in the same period the year before.

For the quarter, the larger firms outperformed the smaller in growth as they have in recent quarters. For the 12 larger companies (excluding Dow, Grace, and Goodrich), sales increased 3% to a combined $9.38 billion. But earnings were up a whopping 69% to $416 million. For the 14 smaller companies (Lubrizol not included), sales were down 2% to $2.23 billion, and earnings increased just 15% to $130 million.

However, the smaller companies continue their dominance in profitability. Profit margins at the smaller companies showed a weighted average in the fourth quarter of 5.8%, up from 5.0% in the same period the year before. The average profit margin for the larger firms

in the fourth quarter was 4.4%, up from 2.7% in the same period of 1985.

For the full year, the story was much the same. For the 26 companies, combined sales increased 3% from 1985 to $47.0 billion. Earnings increased 23% to a total of $2.60 billion.

For the 12 larger firms, combined sales rose 4% to $37.9 billion, and earnings increased 26% to $2.06 billion. For the 14 smaller companies, combined sales fell 1% to $9.13 billion, but earnings rose 15% to $537 million.

Profit margins for the full group averaged 5.5% for 1986, up from 4.6% in 1985. For the larger companies margins averaged 5.4%, up from 4.5% the year before. For the smaller companies profit margins averaged 5.9% for all of 1986, up from 5.1% in 1985.

Apart from the companies that moved out of the deficit column in the fourth quarter, the largest percentage increases for 1986 were posted by American Cyanamid, Union Carbide, and Pennwalt, all of which more than doubled earnings from the previous year. Cyanamid had the biggest increase, with earnings rising 396% from 1985 to $52.1 million on a sales gain of 7%. Chairman George J. Sella Jr. says the increased earnings are the result of new product introductions, continuing cost reduction programs, and increased volumes in overseas markets, as well as the favorable impact of the weaker dollar.

Carbide reported an increase in earnings on continuing operations of 180% over 1985 to $14 million on flat sales of $1.60 billion. And Pennwalt's earnings rose 101% to $12.6 million on a sales rise of 7% to $279 million. Pennwalt chairman Edwin E. Tuttle says, "Chemical earnings were especially strong, increasing 80% over 1985 levels, with gains by the organic and fluorochemicals divisions being particularly impressive. This performance was the result of higher sales volume as well as improved plant operations."

Another company, one of the smaller 14 firms, almost doubling its earnings, is new to C&EN's list and a newly publicly traded company. Aristech, the former chemical arm of USX Corp., which went public in December, showed an earnings gain in the fourth quarter of 98% over the same period the year before to $11.1 million on a 7% decline in sales to $176.0 million.

Chemical companies were not the only firms to register good chemical results. Despite a drop in overall earnings, oil companies' chemical operations exhibited vastly improved results in most cases. For Shell Oil, earnings from chemical products for the fourth quarter increased 327% from fourth-quarter 1985 to $141 million. For the full year, Shell's chemical earnings were up 256% from 1985 to $342 million.

At Chevron, chemical operations contributed $31.0 million in the fourth quarter, compared with a $30 million loss in fourth-quarter 1985. And for full-year 1986, the company posted chemical earnings of $108 million, up from total 1985 chemical earnings of only $3.0 million.

Texaco also came out of a deficit in the fourth quarter of 1985, showing petrochemical earnings in fourth-quarter 1986 of $17 million, compared with a $2.0 million loss in the year-earlier quarter. For full-year 1986, Texaco's petrochemical earnings were $56 million, compared with just $5 million for 1985.

Excluding nonrecurring items, Atlantic Richfield's chemical earnings for the fourth quarter last year increased to $52.0 million from $30 million in the fourth quarter of 1985. For 1986, excluding nonrecurring items, the company's chemical profits totaled $132 million, up from $107 million the year before. □

Du Pont suit seeks key Allied polyester data

Earlier this year, Du Pont filed a suit against Allied-Signal charging that Allied's Petra thermoplastic polyester resin infringed on Du Pont's patent covering Rynite polyester engineering resin. Du Pont is seeking an injunction to halt the production of Petra. The success of the suit may ultimately depend on Allied's use of certain plasticizers and lubricants in the manufacture of its engineering resin.

The suit, filed in U.S. District Court in Wilmington, Del., centers on Patent No. 4,352,904 issued to Du Pont on Oct. 5, 1982. That patent describes the use of polyethylene terephthalate (PET) resins to mold a number of high-gloss engineered components for automotive, aerospace, electrical, and electronic end uses at lower mold temperatures than previously possible.

Documents that Du Pont's legal department filed with the district court do not disclose the exact nature of Allied's alleged infringement on Du Pont's patent. However, the suit requests that Allied submit information concerning key chemical components and processes that may show where Du Pont believes its patent was violated.

Specifically, Du Pont wants to know how Allied may use certain plasticizers and lubricants in forming its PET engineering resin. These plasticizers and lubricants are sodium dimerate, ethylene/acrylic acid copolymer, butyl benzyl phthalate, and any aromatic sulfonamide.

Du Pont also wants to know if any sodium salt is used either during the manufacture of the resins or in the use of the resins for molding. It also seeks specific information on heat requirement and process temperatures required either for resin formulation or molding.

In its suit, Du Pont claims that Allied's Petra resin has captured 10% of the polyester molding resins market. Though Du Pont does not say how large it believes the market to be, industry sources say that Du Pont has 25 million lb of PET thermoplastic resin capacity to Allied's 5 million lb. Mobay Chemical, which is not involved in the Du Pont suit, has a capacity of 20 million lb for its Petlon PET resin, sources say.

According to Lawrence H. Gillespie Jr., a Du Pont polymer products department director, "Du Pont has invested millions of dollars in this technology." To date, he says, Du Pont has commercialized 20 different types of Rynite. "We intend to protect this investment under the rights granted us by the U.S. patent system."

Marc Reisch, New York

Earnings of Canadian Chemical Firms Improved Last Year

Relatively weak fourth quarter for four large companies fails to halt fatter profits on small increases in sales

For most Canadian chemical producers, last year was a good one as far as the bottom line is concerned. That, at least, is the indication based on results of the four major publicly traded Canadian chemical companies tracked by C&EN (C-I-L, Celanese Canada, Du Pont Canada, and Union Carbide Canada). Average net earnings of these four companies jumped a welcome 35% in 1986, even though their combined sales inched ahead only 2.8%.

From other sectors of the Canadian chemical industry, the message seems to be the same: lower or only slightly higher sales, but a big improvement in profit. At Esso Chemical Canada, for instance, 1986 sales were down about 4%, but net earnings increased almost sixfold.

Polysar, the Sarnia-based elastomer and petrochemical giant, also fits the mold. Its sales rose 11% last year to $1.44 billion ($1.00 = 1.393 Canadian dollars, 1986 average). Earnings, however, rose from virtually nothing in 1985 to $20 million last year.

The problem with "average" results, however, is that some companies usually do better and some companies worse. Thus, officials at C-I-L, whose net income slid 49%, may not think that 1986 was as good a year as, say, those at Du Pont Canada. That company chalked up a hefty 193% earnings gain last year.

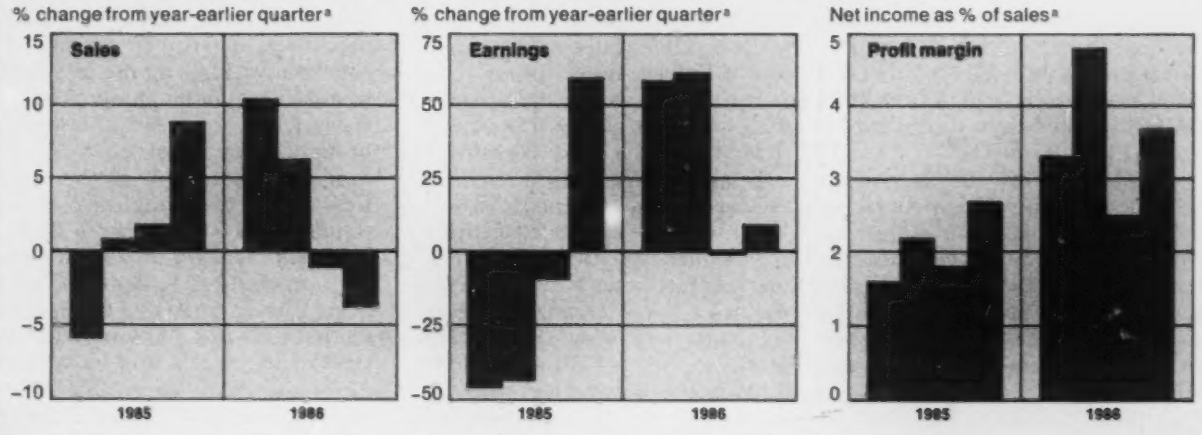
Among Canadian chemical companies last year, earnings performance seemed to depend to a large extent on their product lines. A weak agricultural market hurt companies that rely heavily on fertilizer and agricultural chemicals. In the oil patch, sales of oil field chemicals were off. Losses from methanol operations kept the net income of Celanese Canada lower than it might have been.

On the other hand, profits were surprisingly strong in some chemical sectors, as demand perked up and prices rose. Plastics, fibers, and some industrial chemicals were among the better-performing segments of the Canadian chemical industry last year.

Another factor is that cost-cutting programs over the past few years really have produced some Canadian chemical companies that are "leaner and meaner." J. E. Newall, president of Du Pont Canada, attributes his company's improved profit margins to lower costs and slightly higher prices in many product areas, particularly plastics and fibers. "Improved" profit margins is an understatement. Earnings rose 193% to $43.4 million, as sales improved only 4.8% to $890 million. As a result, Du Pont Canada's profit margin (earnings as a percent of sales) rose to 4.9% last year from 1.7% in 1985.

For Du Pont Canada, the new and

Canadian chemical sales weaken, but profits rebound in fourth quarter



a Based on combined Canadian-currency results of C-I-L, Celanese Canada, Du Pont Canada, and Union Carbide Canada.

Good year for Canadian firms ends on weak fourth quarter

$ Millions[a]	Net sales	Change from 1985[b]	Net income[c]	Change from 1985[b]	Profit margin[d] 1986	1985
FOURTH-QUARTER 1986						
C-I-L	$ 207.6	−7.9%	$ 2.9	−20.0%	1.4%	1.6%
Celanese Canada	65.8	−5.5	3.8	1.9	5.8	5.4
Du Pont Canada	216.2	1.2	10.4	107.1	4.8	2.4
Union Carbide Canada	64.9	−3.2	3.5	−46.2	5.4	9.7
TOTAL	$ 554.5	−3.7%	$20.6	9.1%	3.7%	3.3%
FULL-YEAR 1986						
C-I-L	$ 923.6	2.1%	$14.4	−48.7%	1.6%	3.1%
Celanese Canada	247.2	2.3	13.5	49.2	5.5	3.7
Du Pont Canada	889.9	4.8	43.4	193.2	4.9	1.7
Union Carbide Canada	257.0	−0.5	14.5	26.3	5.6	4.4
TOTAL	$2317.7	2.8%	$85.8	35.4%	3.7%	2.8%

a $1.00 = 1.393 Canadian dollars. b Based on Canadian currency. c Based on continuous operations and excluding extraordinary items. d Net income as percentage of sales.

resale housing market was particularly strong in 1986, as were its automotive and industrial markets. As a result, most of the company's fibers products, as well as engineering plastics, specialty packaging film, and hydrogen peroxide, chalked up healthy gains.

Newall conceded, however, that the resource, agricultural, and electronics sectors of the Canadian economy were "difficult" for Du Pont Canada last year. Weakness in these sectors kept sales of crop protection chemicals about even with 1985 and pushed lower the volume of explosives, polyethylene pipe, and electronic connectors.

At C-I-L, net earnings were down sharply last year, even though sales managed to inch upward 2% to $924 million. Company earnings, at $14.4 million, were down a troublesome 49%, and the primary culprit was the agricultural market. Lower ammonia prices, reduced fertilizer demand, and lower income from crop protection chemicals combined to hurt C-I-L's bottom line.

In addition, profit for its specialty chemicals and services operation fell almost $3 million, reflecting lower sales to gas and oil industry customers. Explosives sales also were down, but both volume and profits increased for such products as plastic films, polymers, caustic soda, and chlorine.

Celanese Canada managed to increase its net income 49%, to $13.5 million, even though sales increased only 2.3% to $247 million. The company's earnings strength came from textiles, chemicals, and industrial products. Cellulosics were particularly strong.

But the company's profit picture would have been even better had it not been for its methanol operation. Celanese has a 2100 metric-ton-per-day methanol plant in Alberta. But methanol supply far outstrips demand. Executive vice president Paul H. Williams says that methanol continues to suffer from depressed prices worldwide. Losses on methanol, he adds, more than offset Celanese Canada's profits from other chemical product lines.

Sales at Union Carbide Canada remained virtually flat last year at $257 million, but net income rose 26% to $14.5 million. These figures reflect sales and income from plastics, chemicals, industrial gases, and carbon operations.

An extraordinary gain of about $22 million, coupled with a small loss from discontinued operations, brought Carbide Canada's final net income for the year up to $34 million. The major "extraordinary item" concerned the sale of the company's consumer product, food casings, and carbon brush businesses during the year.

For most Canadian chemical firms, performance in the fourth quarter was not so good as for the entire year. This may, or may not, be a harbinger of things to come in 1987.

Earl Anderson, New York

Man-made fiber output continues shift from U.S.

Countries other than the U.S., Japan, and those of Western Europe continue to take an ever increasing share of the global output of man-made fibers. That is the conclusion from the latest review compiled by Enka, the fiber-making arm of Akzo of the Netherlands.

In the case of man-made fibers, which include those such as rayon made by chemically modifying natural cellulose, these "other" countries have come a long way fast since their collective output first exceeded that of the U.S. and Western Europe as recently as 1974. Last year, they accounted for almost 49% (some 17.9 billion lb) of the 36.8 billion lb world total. They will pass the 50% mark before long if they maintain the 6.4%-per-year annual growth rate that they have attained since 1980.

Over the same time span, U.S. production has undergone an average annual decline of 1.2% to last year's almost 8 billion lb level (22% of the world total). The slowdown in Japan was half that at 0.6% a year to bring its 1986 output to 3.9 billion lb, 10% of the total. Western Europe, on the other hand, achieved a modest 1.4%-a-year growth to 7.1 billion lb, 19% of the total.

Looking at synthetic fibers, mainly the polyamides (nylons), polyesters, and acrylics, the 1980 to 1986 year-to-year growth among the countries making up the rest of the world is even more pronounced. For them, the average of 8.8% annually brought them to last year's 13.9 billion lb, almost 47% of the world total output of synthetics. U.S. output declined 0.9% yearly to slightly less than 7 billion lb, 23% of world total production. In contrast, annual gains were registered by Japan—a modest 0.2% to 3.1 billion lb in 1986 (10% of the total)—and by Western Europe—a more respectable 3.3% to 5.8 billion lb (20% of global output).

Since 1973, when cellulosic fibers achieved the peak of their global

Production of man-made fibers continues to grow . . .

Billions of lb (% change from previous year)	1986	1985	1984	1983	1982	1980
U.S.	7.97 (2.8%)	7.75 (−2.1%)	7.92 (−1.5%)	8.04 (15.5%)	6.96 (−19.4%)	8.58 (−6.7%)
Western Europe	7.11 (−1.8)	7.24 (−2.3)	7.08 (5.2)	6.73 (5.8)	6.36 (−7.3)	6.55 (−9.5)
Japan	3.85 (−3.3)	3.98 (0.0)	3.98 (2.6)	3.88 (1.6)	3.82 (−2.6)	3.98 (−1.0)
Other	17.85 (7.0)	16.69 (7.2)	15.57 (12.3)	13.87 (6.4)	13.03 (1.1)	12.31 (6.8)
TOTAL	36.78 (3.1%)	35.66 (3.2%)	34.55 (6.2%)	32.52 (7.8%)	30.17 (−6.8%)	31.42 (−1.8%)

. . . reflecting rise in synthetics output

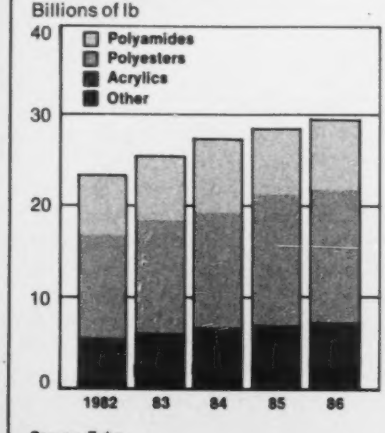
U.S.	6.96 (2.2%)	6.81 (−1.3%)	6.90 (−1.4%)	7.00 (17.3%)	5.97 (−19.8%)	7.37 (−6.7%)
Western Europe	5.78 (−1.2)	5.85 (5.6)	5.54 (6.5)	5.20 (8.3)	4.80 (−7.0)	4.77 (−10.0)
Japan	3.06 (−2.2)	3.13 (2.3)	3.06 (3.7)	2.95 (1.4)	2.91 (−2.0)	3.03 (−1.0)
Other	13.89 (8.5)	12.80 (8.8)	11.76 (15.1)	10.22 (9.5)	9.33 (3.4)	8.37 (9.4)
TOTAL	29.69 (3.8%)	28.59 (4.9%)	27.26 (7.4%)	25.37 (10.3%)	23.01 (−6.5%)	23.54 (−1.5%)

Source: Enka

output of 8.5 billion lb, production has continued to decline. Last year's 7.1 billion lb was about on a par with 1985's, accounting for 19% of the total man-mades. Synthetics, on the other hand, achieved an all-time high of 29.7 billion lb, nearly 4% better than in 1985.

Among the synthetics, polyester fibers accounted for half the total (15.0 billion lb) for the second year running. Indeed, the relative proportion of all the fiber types remained unchanged, 26% (7.6 billion lb) for the polyamides, 18% (5.3 billion lb) for the acrylics, and 6% (1.7 billion lb) for the others—fibers made from polypropylene, polyvinyl chloride, elastomerics, and the like.

Polyesters lead global synthetic fibers output



Source: Enka

Between 1980 and 1986, production of synthetic fibers advanced almost 4% a year on average. The pace of polyester fiber growth was highest, 5.1%, followed by acrylics, 3.0%, and polyamides, 1.4%. Interestingly, the "other" fibers as a class outpaced the rest at 10% per year, representing an absolute gain of almost 80%, although of course they were moving up from a lower weight basis.

On a regional basis, the U.S. last year accounted for some 22% (3.3 billion lb) of total polyester fiber production, followed by Western Europe with 13% (nearly 2 billion lb) and Japan with 9% (some 1.3 billion lb). Making up the 8.4 billion lb balance were the other countries, which together contributed some 56% of the whole, substantially higher than for the other two main classes of synthetics, and reflecting a greater-than-average growth in recent years.

The Enka study notes that capacities in the "other" countries are rapidly being expanded. In terms of volume, the increase in Taiwan and China is the highest.

For the nylons, the U.S. also was the largest single source with about a third (2.5 billion lb) of the world supply. Western Europe held an 18% share (1.4 billion lb), and Japan 8% (600 million lb). Other countries made up the 41% (3.1 billion lb) difference.

Acrylic fibers was the only area in which the U.S. produced the least amount, as has been the case in all previous years. The Enka market analysts put the profile at 34% (1.8 billion lb) for West European countries, 16% (800 million lb) for Japan, 12% (600 million lb) for the U.S., and 38% (2.0 billion lb) for the remaining countries combined.

U.S. output both of the polyester and acrylic fibers has been moving lower at a rate of about 3% annually since 1980. Polyamides, on the other hand, have registered average growth of just less than 1% yearly during the past six years.

Looking at some of the overall factors that influenced the fibers business, the Enka review notes that "in 1986, the world economy was characterized by a continuation of the upswing in industrial nations. The economic development in the U.S. was overshadowed by a further increase in the deficit in the balance of payments. Economic growth in Western Europe continued at virtually the same pace as in 1985."

The lower price of oil helped push up consumption of a wide range of goods. For instance, sales of car and truck tires increased, which in turn called for greater quantities of fibers used in their production. On the other hand, the continuing fall in the dollar's value hit Europe's exports, and resulted in "substantially higher imports of textiles and clothing." Compounding the problem was the arrival in Europe of "very cheap man-made fibers, some at dumped prices."

Dermot O'Sullivan, London

NOTE

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